

NASA SP-7011 (387)
April 1994

NAS 1.21:7211 (387)

8832-J-21

AEROSPACE MEDICINE AND BIOLOGY

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NASA SP-7011 (387)

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AEROSPACE MEDICINE AND BIOLOGY

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This publication was prepared by the NASA Center for Aerospace Information,
800 Elkridge Landing Road, Linthicum Heights, MD 21090-2934, (301) 621-0390.

INTRODUCTION

This issue of *Aerospace Medicine and Biology* (NASA SP-7011) lists 60 reports, articles, and other documents recently announced in the NASA STI Database. The first issue of *Aerospace Medicine and Biology* was published in July 1964.

Accession numbers cited in this issue include:

<i>Scientific and Technical Aerospace Reports (STAR)</i> (N-10000 Series)	N94-21761 — N94-23772
Open Literature (A-10000 Series)	None in this issue

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which humans are subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. Applied research receives the most emphasis, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the publication consists of a standard bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged by *STAR* categories 51 through 55, the Life Sciences division. The citations include the original accession numbers from the respective announcement journals.

Seven indexes—subject, personal author, corporate source, foreign technology, contract number, report number, and accession number—are included.

A cumulative index for 1994 will be published in early 1995.

Information on availability of documents listed, addresses of organizations, and CASI price schedules are located at the back of this issue.

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TYPICAL REPORT CITATION AND ABSTRACT

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ACCESSION NUMBER → N94-11045*# Pennsylvania State Univ., Hershey. Coll. of Medicine. ← **CORPORATE SOURCE**

TITLE → **EFFECTS OF CSF HORMONES AND IONIC COMPOSITION ON SALT/WATER METABOLISM** Final Technical Report, 1 Mar. 1981 - 31 Dec. 1992

AUTHOR → WALTER B. SEVERS 31 Dec. 1992 32 p ← **PUBLICATION DATE**

CONTRACT NUMBER → (Contract NCC2-127)

REPORT NUMBERS → (NASA-CR-193232; NAS 1.26:193232) Avail: CASI HC A03/MF A01 ← **AVAILABILITY AND PRICE CODE**

The consequences of headward fluid shifts during manned spaceflight was studied. Such shifts were recognized early by both U.S. and Soviet scientists because of signs and symptoms referable to the head. Some of these include disturbed vision, puffiness in the face and periorbital areas, headache, vestibular dysfunction, and distended jugular veins. We posited that the fluid shift had an immediate effect on the brain and a long-term action requiring a neural interpretation of the flight environment. This would re-adjust both efferent neural as well as hormonal mechanisms to sustain cardiovascular and fluid/electrolyte balance consonant with survival in microgravity. Work along these lines is summarized. A synopsis of some of the main research is presented. The following topics were studied: (1) angiotensin and vasopressin action in the central nervous system; (2) intracranial pressure control; (3) research on subcommissural organ; and (4) research on the eye.

Author (revised)

TYPICAL JOURNAL ARTICLE CITATION AND ABSTRACT

ACCESSION NUMBER → A94-11095

TITLE → **SEA-LEVEL P(CO₂) RELATES TO VENTILATORY ACCLIMATIZATION AT 4,300 M**

AUTHORS → JOHN T. REEVES, ROBERT E. MCCULLOUGH, LORNA G. MOORE, ALLEN CYMERMAN, and JOHN V. WEIL (Colorado Univ., Denver; U.S. Army, Research Inst. of Environmental Medicine, Natick, MA) ← **AUTHORS' AFFILIATION**

Journal of Applied Physiology (ISSN 8750-7587) vol. 75, no. 3 Sept. 1993 p. 1117-1122. refs ← **JOURNAL TITLE**

CONTRACT NUMBERS → (Contract DAMD81-C-1057; DAMD17-91-C-1112; NIH-HL-14985) Copyright ← **PUBLICATION DATE**

The hypothesis of Hirshman et al. (1978) and Weil (1986) that the large (over an eightfold range) individual variations in the strength of the hypoxic ventilatory response (HVR) observed in the laboratory are related to ventilatory acclimatization to altitude was tested. End-tidal P(CO₂) values were measured in 37 resting subjects at sea level (showing a 34-48 Torr range) and after the subjects were taken to Pikes Peak (4300 m), with measurements made on arrival and repeatedly over 19 days. It was found that, at 4300 m, subjects with high end-tidal P(CO₂) had low values of arterial oxygen saturation, Sa(O₂), and that sea-level end-tidal P(CO₂) related to Sa(O₂) after 19 days at 4300 m. The end-tidal P(CO₂) values on arrival and after 19 days at 4300 m were inversely related to the sea-level HVR values.

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AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 387)

April 1994

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LIFE SCIENCES (GENERAL)

N94-21897* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

SELF-MOTION PERCEPTION AND MOTION SICKNESS Final Report, 1982 - 1991

ROBERT A. FOX (San Jose State Univ., CA.) 1991 150 p (Contract NCC2-167) (NASA-CR-194276; NAS 1.26:194276) Avail: CASI HC A07/MF A02

Motion sickness typically is considered a bothersome artifact of exposure to passive motion in vehicles of conveyance. This condition seldom has significant impact on the health of individuals because it is of brief duration, it usually can be prevented by simply avoiding the eliciting condition and, when the conditions that produce it are unavoidable, sickness dissipates with continued exposure. The studies conducted examined several aspects of motion sickness in animal models. A principle objective of these studies was to investigate the neuroanatomy that is important in motion sickness with the objectives of examining both the utility of putative models and defining neural mechanisms that are important in motion sickness.

N94-21898* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

CHANGES IN PLASMA VASOPRESSIN DURING MOTION SICKNESS IN CATS Abstract Only

ROBERT FOX (San Jose State Univ., CA.), L. KEIL, NANCY G. DAUNTON, D. THOMSEN (San Jose State Univ., CA.), M. DICTOR (San Jose State Univ., CA.), and O. CHEE (San Jose State Univ., CA.) *In its* Self-Motion Perception and Motion Sickness 1 p 1991 Repr. from Neuroscience Abstracts, v. 6, 1980 p 656 Avail: CASI HC A01/MF A02

Changes in levels of plasma vasopressin (AVP) and cortisol (C) have been shown to be correlated with motion sickness and nausea in man. As part of the research aimed at validation of the cat as an appropriate animal model for motion sickness research, levels of these hormones were investigated in the cat during motion sickness elicited by vertical linear acceleration of approximately 0.6 Hz and 1 \pm 0.6 G. In Study 1, 15 cats previously screened for susceptibility to motion sickness were prepared with indwelling jugular catheters to permit withdrawal of blood with minimal disruption of the stimulus and minimum stress to the animal. AVP and C were measured in blood samples obtained during exposure to vertical linear acceleration and during control sessions in which the animals were placed in the stationary apparatus. 10 min and 1 min prior to duration; 1, 5, 10, and 20 min after start of motion. Total duration of exposure to motion was 20 min. The data indicate that both AVP and C are elevated during exposure to motion if emesis occurs. AVP reaches maximum levels during or about the same time as emesis, while C increases gradually throughout the period of vertical acceleration. In Study 2, four cats were prepared with indwelling catheters and AVP was measured in blood withdrawn during exposure to the vertical linear acceleration. A

single pre-motion sample consisting of three samples drawn 5 min prior to motion onset. Two series of samples consisting of three samples drawn at 3-min intervals were obtained during motion. The first series was initiated at emesis, and the second 25 min after emesis. Results show that levels of circulating AVP were elevated (2 to 27 times the control and pre-motion levels) in the samples taken during emesis and decreased, but remained 1 to 6 times above the pre-motion or control levels within 25 min. The results of these two studies indicate that AVP is elevated during motion-produced emesis than is C. These findings are in general agreement with those obtained from humans under motion sickness conditions, and indicate that it is appropriate to continue to use the cat in studies of hormone changes during motion sickness. Author

N94-21899* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

SUSCEPTIBILITY OF THE SQUIRREL MONKEY TO DIFFERENT MOTION CONDITIONS Abstract Only

ROBERT A. FOX (San Jose State Univ., CA.), NANCY G. DAUNTON, and J. COLEMAN (San Jose State Univ., CA.) *In its* Self-Motion Perception and Motion Sickness 1 p 1991 Repr. from Neuroscience Abstracts, v. 8, 1982 p 698 Avail: CASI HC A01/MF A02

The exact stimulus eliciting vomiting in animal studies of motion sickness is difficult to specify because the vestibular stimulation produced by many motion conditions is confounded by voluntary movements with animals. This is an important problem because experiments with animal models of motion sickness can provide useful information about antimotion sickness drugs or the role of neural mechanisms, only when animals are exposed to the same motion stimuli in each experimental session. A series of tests were conducted to determine the susceptibility of 15 adult squirrel monkeys to motion sickness in freely moving and restrained test conditions. Canal stimulation was varied by exposing the monkey in freely moving conditions to varying degrees of angular velocity (60, 90, 120, 150 deg/sec), and in restrained conditions to one angular velocity (150 deg/sec) and to cross-coupling effects of whole-body roll movements during rotation. Otolith stimulation was investigated by using sinusoidal vertical linear acceleration during free movement conditions, and off-vertical rotation and earth-horizontal (BBQ) rotation while restrained. The percentage of freely moving animal vomiting during vertical axis rotation was 27, 93, 85, and 92 for the angular velocities of 60, 90, 120, and 150 deg/sec respectively. None of the monkeys vomited during vertical axis rotation or cross-coupled rotation when restrained. Otolith stimulation appears to be a less provocative stimulus for the squirrel monkey as the percentage of animals vomiting were 13, 0, and 7 for the conditions of free movement during oscillation, restraint during off-vertical, and BBQ rotation respectively. Motion sickness to the point of vomiting occurred regularly only in conditions where self-motion was possible. Such effects could occur because voluntary movement during motion augments vestibular effects by producing self-inflicted cross-coupling, but the failure to elicit vomiting with experimenter-coupling cross-coupling argues against this interpretation. Alternatively, these results might imply that feedback from movement control mechanisms may play an important role in sensory conflict as suggested by Oman's sensory-motor conflict theory. Author

ABSTRACTS

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N94-21900* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

RELATIONSHIP OF AREA POSTREMA TO THREE PUTATIVE MEASURES OF MOTION SICKNESS Abstract Only

R. SUTTON (San Jose State Univ., CA.), ROBERT A. FOX (San Jose State Univ., CA.), and NANCY G. DAUNTON *In its Self-Motion Perception and Motion Sickness* 1 p 1991 Repr. from unidentified source

Avail: CASI HC A01/MF A02

Although the rat has an incomplete emetic reflex, several species-specific responses to motion were proposed as measures of 'motion sickness' in rats. The purpose was to determine the dependence of these responses on one of several neural structures known to be essential to motion-induced vomiting in species with a complete emetic reflex. The Area Postrema (AP) was shown to play an important role in the production of motion sickness in vomiting species. The effects of thermo-cautery ablations of the AP on three different responses supposedly reflecting motion sickness in the rat were compared: conditioned taste aversion (CTA); drinking suppression; and fecal boli. Efficacy of the ablations was determined by subjecting ablated, sham-operated, and unoperated control animals to a CTA test which is known to require a functional AP. Animals with AP ablations failed to form CTA when 0.15 M LiCl was paired with a 10 percent sucrose solution, while sham-operated control subjects conditioned as well as the unoperated control subjects. The extent of the ablations was evaluated histologically at the end of the experiment. To determine the effects of the ablations on the measures of motion sickness, all animals were subjected to rotation for 30 min or 90 min on a platform displaced 20 deg from earth horizontal. Results indicate that ablation of AP in the rat has no effect on the formation of CTA to a 4 percent solution of cider paired with motion, on the suppression of drinking immediately after exposure to motion, or on the frequency of fecal boli during exposure to motion. This failure of AP ablations to eliminate the effects of motion on any of these responses discourages their use as equivalents of motion-induced vomiting. The appropriateness of other suggested measures, e.g., pica, remains untested but the dependence of such measures on stimulation, more severe than commonly used in motion sickness research and the absence of a demonstration of their dependence on neural structures essential to motion sickness in vomiting species, suggest caution in the use of such responses. Further, until more is known about the neural structures underlying these putative measures, the rat will remain a questionable subject in which to study motion sickness.

Author (revised)

N94-21901* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

REASSESSMENT OF AREA POSTREMA'S ROLE IN MOTION SICKNESS AND CONDITIONED TASTE AVERSION Abstract Only

NANCY G. DAUNTON, KENNETH R. BRIZZEE (Tulane Univ., Covington, LA.), MERYL LEE CORCORAN, G. H. CRAMPTON (Wright State Univ., Dayton, OH.), F. DAMELIO, S. EL FAR (San Jose State Univ., CA.), and ROBERT A. FOX (San Jose State Univ., CA.) *In its Self-Motion Perception and Motion Sickness* 1 p 1991 Repr. from unidentified source

Avail: CASI HC A01/MF A02

On the basis of classical studies on the role of the area postrema (AP) in motion-induced emesis it was generally accepted that the AP is an essential structure for the production of vomiting in response to motion. However, in more recent studies it has been demonstrated that vomiting induced by motion can still occur in animals in which the AP has been destroyed bilaterally. It was inferred from some of these more recent studies that the AP plays no role in motion-induced emesis. From the standpoint of the current understanding of central nervous system (CNS) plasticity, redundancy, remodeling, unmasking, regeneration, and recovery of function, however, it is important to realize the limitations of using ablation procedures to determine the functional role of a given neural structure in a highly integrated, adaptable central nervous system (CNS). For example, the results of our

recent investigations in cat and squirrel monkey on the role of the AP in emesis and conditioned taste aversion induced by motion indicate that while AP lesions do not prevent motion-induced emesis when animals are tested 30 days or more after surgery, the lesions do change the latency to emesis. Thus, contradictory findings from lesion studies must be evaluated not only in terms of species difference, differences in lesioning techniques and extent of lesions, and in stimulus parameters, but also in terms of duration of the recovery period, during which significant recovery of function may take place. In our judgment, inadequate consideration of the foregoing factors could lead to erroneous inferences about given structure's role in the behavior of the intact, nonablated animal.

Author (revised)

N94-21902* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

GAMMA-AMINOBUTYRIC ACID (GABA) AND NEUROPEPTIDES IN NEURAL AREAS MEDIATING MOTION-INDUCED EMESIS Abstract Only

F. DAMELIO, NANCY G. DAUNTON, and ROBERT A. FOX *In its Self-Motion Perception and Motion Sickness* 1 p 1991 Repr. from Chinese J. Physiological Sciences, v. 3, 1987, p 443-444

Avail: CASI HC A01/MF A02

Immunocytochemical methods were employed to localize the neurotransmitter amino acid gamma-aminobutyric acid and the neuropeptides substance P and Met-enkephalin in the area postrema (AP), area subpostrema (ASP), nucleus of the tractus solitarius (NTS), dorsal motor nucleus of the vagus nerve (DMNV), and lateral vestibular nucleus (LVN). Glutamic acid decarboxylase immunoreactive (GAD-IR) terminals and fibers were observed in the AP and particularly in the ASP. A gradual decrease in the density of terminals was seen towards the solitary complex. The DMNV revealed irregularly scattered GAD-IR terminals within the neuropil or closely surrounding neuronal cell bodies. The LVN, particularly the dorsal division, showed numerous axon terminals which were mostly localized around large neurons and their proximal dendrites. Substance P immunoreactive (SP-IR) terminals and fibers showed high density in the solitary complex, in particular within the lateral division. The ASP showed medium to low density of SP-IR fibers and terminals. The AP exhibited a small number of fibers and terminals irregularly distributed. The DMNV revealed a high density of SP-IR terminals and fibers that were mainly concentrated in the periphery. Very few terminals were detected in the LVN. Met-enkephalin immunoreactive (Met-Enk-IR) fibers and terminals showed high density and uniform distribution in the DMNV. Scattered terminals and fibers were observed in the AP, ASP, and NTS (particularly the lateral division). The very few fibers were observed in the LVN surrounded the neuronal cell bodies. The present report is part of a study designed to investigate the interaction between neuropeptides and conventional neurotransmitters under conditions producing motion sickness and in the process of sensory-motor adaptation.

Author (revised)

N94-21903* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

DETECTION OF EMETIC ACTIVITY IN THE CAT BY MONITORING VENOUS PRESSURE AND AUDIO SIGNALS Abstract Only

A. NAGAHARA (San Jose State Univ., CA.), ROBERT A. FOX (San Jose State Univ., CA.), NANCY G. DAUNTON, and S. EL FAR *In its Self-Motion Perception and Motion Sickness* 1 p 1991 Repr. from Neuroscience Abstracts, v. 12, Nov. 1986

Avail: CASI HC A01/MF A02

To investigate the use of audio signals as a simple, noninvasive measure of emetic activity, the relationship between the somatic events and sounds associated with retching and vomiting was studied. Thoracic venous pressure obtained from an implanted external jugular catheter was shown to provide a precise measure of the somatic events associated with retching and vomiting. Changes in thoracic venous pressure monitored through an indwelling external jugular catheter with audio signals, obtained from a microphone located above the animal in a test chamber, were compared. In addition, two independent observers visually

monitored emetic episodes. Retching and vomiting were induced by injection of xylazine (0.66mg/kg s.c.), or by motion. A unique audio signal at a frequency of approximately 250 Hz is produced at the time of the negative thoracic venous pressure change associated with retching. Sounds with higher frequencies (around 2500 Hz) occur in conjunction with the positive pressure changes associated with vomiting. These specific signals could be discriminated reliably by individuals reviewing the audio recordings of the sessions. Retching and those emetic episodes associated with positive venous pressure changes were detected accurately by audio monitoring, with 90 percent of retches and 100 percent of emetic episodes correctly identified. Retching was detected more accurately (p is less than .05) by audio monitoring than by direct visual observation. However, with visual observation a few incidents in which stomach contents were expelled in the absence of positive pressure changes or detectable sounds were identified. These data suggest that in emetic situations, the expulsion of stomach contents may be accomplished by more than one neuromuscular system and that audio signals can be used to detect emetic episodes associated with thoracic venous pressure changes.

Author (revised)

N94-21904*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

RECOVERY OF THE VOMITING REFLEX FOLLOWING AREA POSTREMA ABLATION IN SQUIRREL MONKEYS

S. EL FAR, KENNETH R. BRIZZEE (Tulane Univ., Covington, LA.), ROBERT A. FOX (San Jose State Univ., CA.), MERYL LEE CORCORAN, NANCY G. DAUNTON, and J. COLEMAN (San Jose State Univ., CA.) *In its Self-Motion Perception and Motion Sickness* 5 p 1991 Repr. from Neuroscience Abstracts, v. 12, Nov. 1986

Avail: CASI HC A01/MF A02

The role of the area postrema (AP) in motion-induced emesis was re-assessed recently in several different species. In a few of these studies, the role of the AP in motion-induced conditioned taste aversion (CTA) was also addressed. The purpose was to extend this comparative study to the squirrel monkey, to evaluate further the role of AP in vomiting, and to investigate the dynamics of the recovery process. The AP was ablated bilaterally in 7 motion-susceptible squirrel monkeys which previously had been characterized in terms of their responses to various motion sickness-inducing stimuli. After recovery from surgery all animals were tested at 30-day intervals for a period of 11 months to determine the effects of AP ablations on susceptibility to the same sickness-inducing conditions. In addition, the effectiveness of motion in producing CTA was evaluated. All pre-ablation motion tests involved stimulation for 30 min., while post-lesion tests were 60 min., in duration. All animals showed significant increases in latencies to vomiting after AP ablations. However, the latencies tended to decrease with time after ablation. All but one animal vomited on at least one of the 10 motion tests occurring after ablation of AP. In addition, CTA was produced by motion used in the conditioning sessions. These results suggest that structures other than AP, and processes other than those mediated through AP, may play an important role in motion-induced emesis.

Author (revised)

N94-21905*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

MOTION SICKNESS ELICITED BY PASSIVE ROTATION IN SQUIRREL MONKEYS

NANCY G. DAUNTON and ROBERT A. FOX (San Jose State Univ., CA.) *In its Self-Motion Perception and Motion Sickness* 2 p 1991 Repr. from Vestibular and Visual Control on Posture and Locomotion Equilibrium, 1983 p 164-169

(Contract NCA2-OR-675-801; NIH-S06RR08192-02)

Avail: CASI HC A01/MF A02

Current theory and recent evidence suggest that motion sickness occurs under conditions of sensory input in which the normal motor programs for producing eye, head, and body movements are not functionally effective, i.e. under conditions in which there are difficulties in maintaining posture and controlling

eye movements. Conditions involving conflicting or inconsistent visual-vestibular (VV) stimulation should thus result in greater sickness rates since the existing motor programs do not produce effective control of eye-head-body movements under such conditions. It is felt that the relationship of postural control to motion sickness is an important one and one often overlooked. The results are reported which showed that when postural requirements were minimized by fully restraining squirrel monkeys during hypogravity parabolic flight, no animals became motion sick, but over 80 percent of the same 11 animals became sick if they were unrestrained and maintained control of their posture.

Author (revised)

N94-21906*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

AREA POSTREMA ABLATIONS IN CATS: EVIDENCE FOR SEPARATE NEURAL ROUTES FOR MOTION- AND XYLAZINE-INDUCED CTA AND EMESIS Abstract Only

MERYL LEE CORCORAN, ROBERT A. FOX (San Jose State Univ., CA.), KENNETH R. BRIZZEE (Tulane Univ., Covington, LA.), G. CRAMPTON (Wright State Univ., Dayton, OH.), and NANCY G. DAUNTON *In its Self-Motion Perception and Motion Sickness* 1 p 1991 Repr. from The Physiologist, v. 28., no. 4, Aug. 1985

Avail: CASI HC A01/MF A02

Previous studies on the role of the area postrema (AP) in vomiting induced in the cat by motion and drugs have shown that the AP is not essential for motion-induced vomiting, but is necessary for vomiting to apomorphine and xylazine. To confirm these findings and to determine the role of the AP in the formation of Conditioned Taste Aversion (CTA), the AP was ablated bilaterally in 10 adult female cats. With one exception, the ablated cats continued to vomit to the same motion that elicited emesis before the ablation. Doses of xylazine and apomorphine that elicit emesis in intact cats, failed to induce emesis in the ablated cats. Histological examination indicated that 8 cats had complete lesions and 2 had partial lesions. Investigations of effects of AP ablations on CTA revealed that cats with complete lesions did not form CTA to flavored milk paired with xylazine-induced CTA. Seven of the eight completely lesioned cats developed motion-induced CTA, even though emesis was not consistently elicited by motion. These results suggest that there are multiple routes for inducing CTA and the emetic reflex, that CTA can form without eliciting emesis, and that CTA may be a sensitive measure of sub-emetic motion sickness.

Author

N94-21907*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

EFFECT OF COPPER SULPHATE ON THE RATE OF AFFERENT DISCHARGE IN THE GASTRIC BRANCH OF THE VAGUS NERVE IN THE RAT

AKIRA NIJIMA (Niigata Univ., Japan.), ZHENG-YAO JIANG (Niigata Univ., Japan.), NANCY G. DAUNTON, and ROBERT A. FOX (San Jose State Univ., CA.) *In its Self-Motion Perception and Motion Sickness* 4 p 1991 Repr. from Neuroscience Letters, v. 80, 1987 p 71-74

Avail: CASI HC A01/MF A02

The afferent nerve activity was recorded from a nerve filament isolated from the peripheral cut end of the gastric branch of the vagus nerve. The gastric perfusion of 4 ml of two different concentrations (0.04 percent and 0.08 percent) of CuSO₄ solution provoked an increase in afferent activity. The stimulating effect of the 0.08 percent solution was stronger than that of the 0.04 percent solution, and lasted for a longer period of time. The observations suggest a possible mechanism by which CuSO₄ elicits emesis.

Author (revised)

N94-21908*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

CONDITIONED TASTE AVERSION INDUCED BY MOTION IS PREVENTED BY SELECTIVE VAGOTOMY IN THE RAT

ROBERT A. FOX (San Jose State Univ., CA.) and SUSAN MCKENNA (San Jose State Univ., CA.) *In its Self-Motion Perception and Motion Sickness* 10 p 1991 Repr. from

51 LIFE SCIENCES (GENERAL)

Behavioral and Neural Biology, v. 50, 1988 p 275-284
(Contract NCC2-1421)

Avail: CASI HC A02/MF A02

The role of the vagus nerve in motion-induced conditioned taste aversion (CTA) was studied in hooded rats. Animals with complete, selective gastric vagotomy failed to form conditioned taste aversion after multiple conditioning sessions in which the conditioned stimulus (a cider vinegar solution) was drunk immediately before a 30-min exposure to vertical axis rotation at 150 deg/s. Results are discussed with reference to the use of CTA as a measure of motion-induced 'sickness' or gastrointestinal disturbance, and because motion-induced CTA requires that both the vagus nerve and the vestibular apparatus be intact, in light of the possible convergence of vagal and vestibular functions.

Author (revised)

N94-21909* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

IMMUNOCYTOCHEMICAL LOCALIZATION OF GLUTAMIC ACID DECARBOXYLASE (GAD) AND SUBSTANCE P IN NEURAL AREAS MEDIATING MOTION-INDUCED EMESIS: EFFECTS OF VAGAL STIMULATION ON GAD IMMUNOREACTIVITY

F. DAMELIO (San Jose State Univ., CA.), M. A. GIBBS, W. R. MEHLER, NANCY G. DAUNTON, and ROBERT A. FOX (San Jose State Univ., CA.) *In its Self-Motion Perception and Motion Sickness* 12 p 1991 Repr. from Basic and Applied Aspects of Vestibular Function, 1988

Avail: CASI HC A03/MF A02

Immunocytochemical methods were employed to localize the neurotransmitter amino acid gamma-aminobutyric acid (GABA) by means of its biosynthetic enzyme glutamic acid decarboxylase (GAD) and the neuropeptide substance P in the area postrema (AP), area subpostrema (ASP), nucleus of the tractus solitarius (NTS), and gelatinous nucleus (GEL). In addition, electrical stimulation was applied to the right vagus nerve at the cervical level to assess the effects on GAD-immunoreactivity (GAR-IR). GAD-IR terminals and fibers were observed in the AP, ASP, NTS, and GEL. They showed pronounced density at the level of the ASP and gradual decrease towards the solitary complex. Nerve cells were not labelled in our preparations. Ultrastructural studies showed symmetric or asymmetric synaptic contacts between labelled terminals and non-immunoreactive dendrites, axons, or neurons. Some of the labelled terminals contained both clear- and dense-core vesicles. Our preliminary findings, after electrical stimulation of the vagus nerve, revealed a bilateral decrease of GAD-IR that was particularly evident at the level of the ASP. SP-immunoreactive (SP-IR) terminals and fibers showed varying densities in the AP, ASP, NTS, and GEL. In our preparations, the lateral sub-division of the NTS showed the greatest accumulation. The ASP showed medium density of immunoreactive varicosities and terminals and the AP and GEL displayed scattered varicose axon terminals. The electron microscopy revealed that all immunoreactive terminals contained clear-core vesicles which make symmetric or asymmetric synaptic contact with unlabelled dendrites. It is suggested that the GABAergic terminals might correspond to vagal afferent projections and that GAD/GABA and substance P might be co-localized in the same terminal allowing the possibility of a regulated release of the transmitters in relation to demands.

Author (revised)

N94-21910* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

THE EFFECTS OF AREA POSTREMA LESIONS AND SELECTIVE VAGOTOMY ON MOTION-INDUCED CONDITIONED TASTE AVERSION

ROBERT A. FOX (San Jose State Univ., CA.), R. L. SUTTON (California Univ., Los Angeles.), and SUSAN MCKENNA (San Jose State Univ., CA.) *In its Self-Motion Perception and Motion Sickness* 6 p 1991 Repr. from Basic and Applied Aspects of Vestibular Function, 1988

Avail: CASI HC A02/MF A02

Conditioned taste aversion (CTA) is one of several behaviors

which was suggested as a putative measure of motion sickness in rats. A review is made of studies which used surgical disruption of area postrema or the vagus nerve to investigate whether CTA and vomiting induced by motion may depend on common neural pathways or structures. When the chemoreceptive function of the area postrema (AP) is destroyed by complete ablation, rats develop CTA and cats and monkeys develop CTA and vomit. Thus the AP is not crucially involved in either CTA or vomiting induced by motion. However, after complete denervation of the stomach or after labyrinthectomy rats do not develop CTA when motion is used as the unconditioned stimulus. Studies of brainstem projections of the vagus nerve, the area postrema, the periaqueductal grey, and the vestibular system are used as the basis for speculation about regions which could mediate both motion-induced vomiting and behavioral food aversion. Author

N94-21911* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

EXPERIMENTAL STUDIES OF GASTRIC DYSFUNCTION IN MOTION SICKNESS: THE EFFECT OF GASTRIC AND VESTIBULAR STIMULATION ON THE VAGAL AND SPLANCHNIC GASTRIC EFFERENTS

A. NIJIMA (Niigata Univ., Japan.), Z. Y. JIANG (Niigata Univ., Japan.), NANCY G. DAUNTON, and ROBERT A. FOX (San Jose State Univ., CA.) *In its Self-Motion Perception and Motion Sickness* 10 p 1991 Repr. from Basic and Applied Aspects of Vestibular Function, 1988

Avail: CASI HC A02/MF A02

The experiments were conducted in anaesthetized rats. In the first part of the experiments, the effect of CuSO₄ on the afferent activity in the gastric branch of the vagus nerve was investigated. Gastric perfusion of CuSO₄ solution (0.04 percent and 0.08 percent) provoked an increase in afferent activity. In the second part of the experiments, the reflex effects of gastric perfusion of CuSO₄ solution, repetitive stimulation of the gastric vagus nerve, and caloric stimulation of the right vestibular apparatus (5-18 C water) on gastric autonomic outflow were investigated. The results of these experiments showed that these three different types of stimulation caused an inhibition in efferent activity of the gastric vagus nerve and a slight activation of the splanchnic gastric efferents. The summation of the effect of each stimulation was also observed. These results, therefore, provide evidence for a possible integrative inhibitory function of the vagal gastric center as well as an excitatory function of gastric sympathetic motoneurons in relation to motion sickness. Author

N94-21912* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

ROLE OF THE AREA POSTREMA IN THREE PUTATIVE MEASURES OF MOTION SICKNESS IN THE RAT

RICHARD L. SUTTON (San Jose State Univ., CA.), ROBERT A. FOX (San Jose State Univ., CA.), and NANCY G. DAUNTON *In its Self-Motion Perception and Motion Sickness* 20 p 1991 Repr. from Behavioral and Neural Biology, v. 50, 1988 p 133-152

Avail: CASI HC A03/MF A02

After thermal cauterization of the area postrema in rats, the absence of conditioned taste aversion of sucrose paired with lithium chloride (0.15M, 3.3) ml/kg was used as a pharmacologic/behavioral index of area postrema damage. In a subsequent experiment the effects of area postrema lesions on three measures proposed as species-relevant measures of motion sickness were studied, using off-vertical rotation at 150 deg/s for either 30 or 90 min. Lesions of area postrema did not alter postrotational suppression of drinking or amount of defecation during motion. The initial acquisition of conditioned taste aversion to a novel cider vinegar solution paired with motion was not affected by lesioning of the area postrema, but these taste aversions extinguished more slowly in lesioned rats than in sham-operates or intact controls. Results are discussed in terms of proposed humoral factors which may induce motion sickness and in light of recent data on the role of the area postrema in similar measures in species possessing the complete emetic reflex.

Author (revised)

N94-21913* # San Jose State Univ., CA.

**INVESTIGATING MOTION SICKNESS USING THE
CONDITIONED TASTE AVERSION PARADIGM**

ROBERT A. FOX *In* NASA. Ames Research Center, Self-Motion Perception and Motion Sickness 17 p 1991 Repr. from Motion and Space Sickness, 1990

Avail: CASI HC A03/MF A02

The avoidance of foods which are associated with uncomfortable or aversive internal states has long been recognized. Many people are aware, either directly or via anecdotal reports, of individuals who avoid foods which were eaten just before the onset of sickness. Awareness of this phenomenon can be traced to the writings of John Locke. The disruption of diet during cancer therapy is sometimes ascribed to the attribution of an unpleasant quality to foods eaten preceding the sickness induced by therapy itself. In addition, it has long been recognized by the manufacturers of rodent poisons that animals avoid the injection of food treated with nonlethal doses of poison. An important part of the laboratory study of this phenomenon was directed toward studying the role learning plays in this type of avoidance behavior. Following the lead of Garcia and his associates, this avoidance has come to be interpreted as arising from a form of classical conditioning. In typical laboratory studies of this behavior, a novel food is ingested just prior to exposure to some stimulus, commonly poisoning or irradiation, which produces illness. Following the terminology of classical conditioning, it is common to describe this procedure as one of 'pairing' a conditioned stimulus (CS), the novel food, with an unconditioned stimulus (US), the illness induced by toxicosis or irradiation. Avoidance of the food in succeeding feeding opportunities is viewed as a learned response or a conditioned taste aversion (CTA). Garcia et al. asserted that motion sickness could produce 'gustatory' aversions, but passive motion was first reported as an US to establish CTA by Green and Rachlin. The purpose is to review the manner in which CTA has been used to study motion sickness. Numerous reviews concentrating on other aspects of CTA are available in the existing literature. Readers are encouraged to consult the various papers and edited books for extensive information on other aspects of this literature.

Author (revised)

N94-21914* # National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**CONDITIONED TASTE AVERSION AND MOTION SICKNESS IN
CATS AND SQUIRREL MONKEYS**

ROBERT A. FOX (San Jose State Univ., CA.), MERYL LEE CORCORAN, and KENNETH R. BRIZZEE (Tulane Univ., Covington, LA.) *In* its Self-Motion Perception and Motion Sickness 10 p 1991 Repr. from unidentified source

Avail: CASI HC A02/MF A02

The relationship between vomiting and conditioned taste aversion was studied in intact cats and squirrel monkeys and in cats and squirrel monkeys in which the area postrema was ablated by thermal cautery. In cats conditioned 7-12 months after ablation of the area postrema, three successive treatments with xylazine failed to produce either vomiting or conditioned taste aversion to a novel fluid. Intact cats, however, vomited and formed a conditioned aversion. In squirrel monkeys conditioned 6 months after ablation of the area postrema, three treatments with lithium chloride failed to produce conditioned taste aversion. Intact monkeys did condition with these treatments. Neither intact nor ablated monkeys vomited or evidenced other signs of illness when injected with lithium chloride. When the same ablated cats and monkeys were exposed to a form of motion that produced vomiting prior to surgery, conditioned taste aversion can be produced after ablation of the area postrema. The utility of conditioned taste aversion as a measure of subemetic motion sickness is discussed by examining agreement and disagreement between identifications of motion sickness by conditioned taste aversion and vomiting. It is suggested that a convincing demonstration of the utility of conditioned taste aversion as a measure of nausea requires the identification of physiological correlates of nausea, and caution should be exercised when attempting to interpret conditioned taste aversion as a measure of nausea.

Author

N94-21915* # San Jose State Univ., CA.

CURRENT STATUS: ANIMAL MODELS OF NAUSEA

ROBERT A. FOX *In* NASA. Ames Research Center, Self-Motion Perception and Motion Sickness 10 p 1991 Repr. from Mechanisms and Control of Emesis, v. 223, 1992 p 341-350

Avail: CASI HC A02/MF A02

The advantages, and possible benefits of a valid, reliable animal model for nausea are discussed, and difficulties inherent to the development of a model are considered. A principle problem for developing models arises because nausea is a subjective sensation that can be identified only in humans. Several putative measures of nausea in animals are considered, with more detailed consideration directed to variation in cardiac rate, levels of vasopressin, and conditioned taste aversion. Demonstration that putative measures are associated with reported nausea in humans is proposed as a requirement for validating measures to be used in animal models. The necessity for a 'real-time' measure of nausea is proposed as an important factor for future research; and the need for improved understanding of the neuroanatomy underlying the emetic syndrome is discussed.

Author (revised)

N94-23088* # National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**INCREASING ACCURACY IN THE ASSESSMENT OF MOTION
SICKNESS: A CONSTRUCT METHODOLOGY**

CYNTHIA S. STOUT and PATRICIA S. COWINGS Dec. 1993 17 p

(Contract RTOP 199-70-12-14)

(NASA-TM-108797; A-94014; NAS 1.15:108797) Avail: CASI HC A03/MF A01

The purpose is to introduce a new methodology that should improve the accuracy of the assessment of motion sickness. This construct methodology utilizes both subjective reports of motion sickness and objective measures of physiological correlates to assess motion sickness. Current techniques and methods used in the framework of a construct methodology are inadequate. Current assessment techniques for diagnosing motion sickness and space motion sickness are reviewed, and attention is called to the problems with the current methods. Further, principles of psychophysiology that when applied will probably resolve some of these problems are described in detail.

Author (revised)

N94-23241* # University of Central Florida, Orlando. Dept. of Chemistry.

**CHEMICAL CHARACTERIZATION OF SOME AEROBIC
LIQUIDS IN CELLS**

BROOKS C. MADSEN *In* NASA. Kennedy Space Center, NASA/ASEE Summer Faculty Fellowship Program p 269-299 Oct. 1993

Avail: CASI HC A03/MF A04

Untreated aqueous soybean and wheat leachate and aerobically treated wheat leachate prepared from crop residues that are produced as a component of the Controlled Ecological Life Support System program designed to support long duration space missions were compared, and a general chemical characterization was accomplished. Solid phase extraction and high performance liquid chromatography were used to accomplish comparisons based on chromatographic and ultraviolet absorption properties of the components that are present. Specific compounds were not identified; however, general composition related to the initial presence of phenol-like compounds and their disappearance during aerobic treatment was explored.

Author (revised)

N94-23454* # Amsterdam Univ. (Netherlands). Dept. of Experimental Zoology.

**ELECTROPHYSIOLOGY OF THE RAT NUCLEUS ACCUMBENS:
LOCAL CIRCUITRY, NEUROMODULATION AND SYNAPTIC
PLASTICITY Ph.D. Thesis**

C. PENNARTZ 1992 222 p

(PB93-232254) Copyright Avail: CASI HC A10/MF A03

The general aim of the thesis is to elucidate neurotransmitter and neuromodulator functions in a limbic-innervated part of the basal ganglia--the nucleus accumbens. This basal forebrain nucleus

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is presumed to have a variety of functions, including regulation of reward-dependent behavior, modulation of neuroendocrine function and feedback to limbic cortico-thalamic circuits. All experiments were done in an in vitro slice preparation that comprised the nucleus accumbens and closely adjacent brain structures. NTIS

N94-23468 Argonne National Lab., IL.

APPLICATIONS OF THE AURORA PARALLEL PROLOG SYSTEM TO COMPUTATIONAL MOLECULAR BIOLOGY

E. L. LUSK, R. OVERBEEK, S. MUDAMBI (Knox Coll., Galesburg, IL.), and P. SZEREDI (IQSOFT, Budapest, Hungary.) 1993 15 p Presented at the International Logic Programming Symposium, Vancouver, British Columbia, 26-29 Oct. 1993 Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(Contract W-31-109-ENG-38)

(DE93-041166; ANL/MCS/CP-80305; CONF-9310172-1) Avail: CASI HC A03

We describe an investigation into the use of the Aurora parallel Prolog system in two applications within the area of computational molecular biology. The computational requirements were large, due to the nature of the applications, and were carried out on a scalable parallel computer, the BBN 'Butterfly' TC-2000. Results include both a demonstration that logic programming can be effective in the context of demanding applications on large-scale parallel machines and some insights into parallel programming in Prolog. DOE

N94-23501* California Univ., Irvine.

INVESTIGATION OF EVOLUTION-RELATED ASPECTS OF BACTERIAL RHODOPSINS Final Report

19 Jan. 1994 4 p

(Contract NAGW-212)

(NASA-CR-194826; NAS 1.26:194826) Avail: CASI HC A01/MF A01

We have investigated evolution-related aspects of bacterial rhodopsins, the unique retinal-based energy transducing systems of halophilic archae. The approach was to describe both structural and functional aspects: the structure by sequencing genes to explore which regions are conserved, and the function by comparing proton and chloride transport in the closely related systems, bacteriorhodopsin and halorhodopsin, respectively. In the latter, we have made a good start toward the ultimate goal of separating the attributes of the general principles of retinal-based ionic pumps from those of the specific ion specificities, by determining the thermodynamics of the internal steps of the protein-mediated active transport process, as well as some of the intraprotein ion-transfer steps. Our present emphasis is on continuing to acquire the tools for studying what distinguishes proton transport from chloride transport. We consider it important, therefore, that we have been able to provide firm mathematical grounds for the kinetics analyses which underlies these studies. Our molecular biological studies have received a great boost from the expression vector for the bop gene based on a halobacterial plasmid, that we recently developed. Derived from text

N94-23521* Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Analysis, Algebra and Geometry.

THE COMPUTATION OF $R(\text{sub } 0)$ FOR DISCRETE-TIME EPIDEMIC MODELS WITH DYNAMIC HETEROGENEITY

M. C. M. DEJONG (CDI, Lelystad, Netherlands.), O. DIEKMANN (Leiden Univ., Netherlands.), and J. A. P. HEESTERBEEK Jan. 1993 20 p

(ISSN 0924-2953)

(CWI-AM-R9301; ETN-94-94712) Copyright Avail: CASI HC A03/MF A01

An explicit algorithm for the computation of the basic reproduction ratio $R(\text{sub } 0)$ for a class of discrete time epidemic models is given. These models allow for a finite number of different individual types, type changes at fixed time dependent intervals, arbitrary contact intensity between individuals of the various types and variable infectivity. The models reflect the situation where an

infectious disease spreads in a population of animals that are reared in different stables on farms. It is shown analytically that $R(\text{sub } 0)$ depends, for any given type, on the product of the susceptibility and the total infectivity of that type and not on these factors separately. This product is called the transmission weight of the type. The maximum overall transmission weights gives an upper bound for $R(\text{sub } 0)$, irrespective of the particular submodels for type change and contact structure. Therefore, reduction of all transmission weights below one, by vaccination or some other control measure, will result in $R(\text{sub } 0)$ less than 1 and will hence lead to eradication of the disease. ESA

N94-23538* University of South Florida, Saint Petersburg.

ALGORITHM-DEVELOPMENT ACTIVITIES Quarterly Report, Jul. - Dec. 1993

KENDALL L. CARDER 15 Jan. 1994 26 p

(Contract NAS5-31716)

(NASA-CR-193225; NAS 1.26:193225) Avail: CASI HC A03/MF A01

The task of algorithm-development activities at USF continues. The algorithm for determining chlorophyll alpha concentration, (Chl alpha) and gelbstoff absorption coefficient for SeaWiFS and MODIS-N radiance data is our current priority. Derived from text

N94-23633* Texas Univ., San Antonio.

MONOCLONAL ANTIBODIES DIRECTED AGAINST SURFACE MOLECULES OF MULTICELL SPHEROIDS Semiannual Status Report, 1 Jul. - 31 Dec. 1993

ANDREW O. MARTINEZ 31 Dec. 1993 33 p

(Contract NAG2-819)

(NASA-CR-195102; NAS 1.26:195102) Avail: CASI HC A03/MF A01

The objective of this project is to generate a library of monoclonal antibodies (MAbs) to surface molecules of mammalian tumor and transformed cells grown as multicell spheroids (MCS). These MCS are highly organized, three dimensional multicellular structures which exhibit many characteristics of in vivo organized tissues not found in conventional monolayer or suspension culture; therefore, MCS make better in vitro model systems to study the interactions of mammalian cells. Additionally, they provide a functional assay for surface adhesion molecules. Derived from text

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AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

N94-21863* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

SPACEFLIGHT RADIATION HEALTH PROGRAM AT THE LYNDON B. JOHNSON SPACE CENTER

A. STEVE JOHNSON (Krug Life Sciences, Inc., Houston, TX.), GAUTAM D. BADHWAR, MICHAEL J. GOLIGHTLY, ALVA C. HARDY, ANDREI KONRADI, and TRACY CHUI-HSU YANG Dec. 1993 20 p

(NASA-TM-104782; S-742; NAS 1.15:104782) Avail: CASI HC A03/MF A01

The Johnson Space Center leads the research and development activities that address the health effects of space radiation exposure to astronaut crews. Increased knowledge of the composition of the environment and of the biological effects of space radiation is required to assess health risks to astronaut crews. The activities at the Johnson Space Center range from quantification of astronaut exposures to fundamental research into the biological effects resulting from exposure to high energy particle radiation. The Spaceflight Radiation Health Program seeks to balance the requirements for operational flexibility with the requirement to

minimize crew radiation exposures. The components of the space radiation environment are characterized. Current and future radiation monitoring instrumentation is described. Radiation health risk activities are described for current Shuttle operations and for research development program activities to shape future analysis of health risk. Author

N94-22732# CryoLife, Inc., Marietta, GA.
CELLULAR AND TISSUE INJURY DURING NONFREEZING COLD INJURY AND FROSTBITE Report No. 8, May - Aug. 1993

PATRICK CURRAN 30 Sep. 1993 76 p
 (Contract N00014-91-C-0044)

(AD-A270883) Avail: CASI HC A05/MF A01

We have continued our investigations in the following five major areas: (1) the effects of cold-induced membrane phase changes on the function of transmembrane ion pumps; (2) the mechanism of metabolic inhibition under cold, acidotic conditions; (3) the influence of these conditions on the function of skeletal and smooth muscle; (4) the role of free radicals in reperfusion injury in human cells; and (5) developing methods for amelioration of cell and tissue damage during non-freezing injury and frostbite, based on the results of the aforementioned studies. Abstracts and publications presented since Apr. 1993 are listed in Appendix 1. The text of the abstracts and publications described in this report may be found in Appendix 2. DTIC

N94-23313# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).

CARDIOPULMONARY ASPECTS IN AEROSPACE MEDICINE [LES ASPECTS CARDIOPULMONAIRES EN MEDECINE AEROSPATIALE]

Oct. 1993 74 p Lectures held in Lisbon, Portugal, 25-26 Oct. 1993, in Athens, Greece, 1-2 Nov. 1993, in Ankara, Turkey, 4-5 Nov. 1993, and in Brussels, Belgium, 8-9 Nov. 1993
 (AGARD-LS-189; ISBN-92-835-0722-3) Copyright Avail: CASI HC A04/MF A01

This Lecture Series will update the information presented in the 1987 AGARD Short course on the Cardiopulmonary Aspects of Aerospace Medicine, and will be of primary relevance to military internists and cardiologists with an interest in aviation medicine, and to military Flight Surgeons. Topics to be discussed will include the following: screening to asymptomatic coronary artery disease in an aircrew population; the aeromedical disposition of aviators with coronary disease; the utility of screening aircrew candidates with echocardiography and echocardiographic findings in trained aircrew; etc. The Lecture Series is designed to be interactive rather than strictly didactic to encourage discussion of problems particular to participating NATO countries.

N94-23314# Defence and Civil Inst. of Environmental Medicine, Toronto (Ontario). Medical Assessment Section.

CARDIOVASCULAR AND PULMONARY DISEASE IN NATO AIRCREW: AN OVERVIEW

GARY W. GRAY In AGARD, Cardiopulmonary Aspects in Aerospace Medicine 6 p Oct. 1993
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In 1987, the AGARD Aeromedical Panel (AMP) sponsored a Short Course on the Cardiopulmonary Aspects of Aerospace Medicine. The aim of the course was to disseminate current information about the aeromedical implications of cardiac and pulmonary conditions to NATO Flight Surgeons. At the time of the first course, it was proposed that an update course be run every five to six years to keep NATO Flight Surgeons abreast of current developments in aviation cardiology and pulmonology. Since the 1987 Lecture Series, there have been a number of new developments in aviation cardiology. The purpose of this Lecture Series is to disseminate this information. Author (revised)

N94-23315# Air Force Systems Command, Brooks AFB, TX. Clinical Sciences Div.

SCREENING FOR ASYMPTOMATIC CORONARY HEART DISEASE

WILLIAM B. KRUYER In AGARD, Cardiopulmonary Aspects in Aerospace Medicine 5 p Oct. 1993

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Predicting the presence of coronary heart disease in an asymptomatic population is a very difficult task. Because of the possible sudden and incapacitating presentation of coronary heart disease and its common occurrence in industrialized nations, screening for this disorder is an important aeromedical concern. Nonsignificant disease can lead to coronary events and is also likely to progress to significant disease. Also, lifestyle changes and other interventions may affect the progress of insignificant disease. Screening efforts in the military aviator population should therefore be aimed at detecting any measurable degree of disease. This review will discuss problems inherent to screening an asymptomatic population, different screening tests, and risk stratified approaches to screening for coronary heart disease. Author (revised)

N94-23316# Air Force Systems Command, Brooks AFB, TX. Clinical Sciences Div.

AEROMEDICAL DISPOSITION FOR CORONARY ARTERY DISEASE

P. V. CELIO In AGARD, Cardiopulmonary Aspects in Aerospace Medicine 6 p Oct. 1993

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Coronary artery disease continues to be a significant concern in aerospace medicine. Coronary disease is a major cause of deaths and sudden incapacitation for males in the flying age population. When coronary disease is found in an aviator, the benefits of his remaining on flying duties must be weighed against his risk of an incapacitating event. The following chapter reviews the probability of a cardiac event in populations of varying degrees of coronary disease including patients following myocardial infarction, angioplasty, and coronary artery bypass surgery. The U.S. Air Force (USAF) experience and recommendation for flying waivers will also be discussed. Author

N94-23317# Air Force Systems Command, Brooks AFB, TX. Clinical Sciences Div.

PRIMARY PREVENTION OF CORONARY HEART DISEASE

WILLIAM B. KRUYER In AGARD, Cardiopulmonary Aspects in Aerospace Medicine 6 p Oct. 1993

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The primary prevention of coronary heart disease is a very prominent and vigorously discussed topic in the medical literature, especially in the area of appropriate lipid profile management. Secondary preventive efforts in patients with known disease seem to be clearly beneficial, but the literature and opinions vary considerably regarding primary preventive efforts and how the existing data should be applied to other patient population subgroups. Studies demonstrating regression of coronary artery atherosclerotic lesions seem to lend support to the validity of primary prevention. This topic is of major interest to the military aerospace medicine practitioner. Classic risk factors which are most applicable to the military aviator include lipid profile, smoking, and regular exercise. These factors will be discussed with pertinent information from the literature with the intent of providing a better understanding of the issues and a reasonable approach to this problem. Author (revised)

N94-23318# Air Force Systems Command, Brooks AFB, TX. Clinical Sciences Div.

AEROMEDICAL DISPOSITION OF ARRHYTHMIAS AND ELECTROCARDIOGRAPHIC FINDINGS IN AIRCREW

P. V. CELIO In AGARD, Cardiopulmonary Aspects in Aerospace Medicine 9 p Oct. 1993

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Screening asymptomatic individuals for occult cardiac disease continues to be a difficult task. One of the standard screening procedures continues to be electrocardiography. Electrocardiography is neither a sensitive nor specific tool in identifying heart disease but continues to offer useful information. Interpretation of these studies for aeromedical purposes requires

an appreciation for certain differences between a standard clinical population from which the significance of most ECG findings were obtained and the asymptomatic, generally healthy aviator population. The United States Air Force Central Electrocardiographic Library is the repository for all electrocardiograms obtained on Air Force aviators. This facility was established in 1957 in order to review electrocardiograms performed on Air Force aviators to determine the significance of electrocardiographic findings in asymptomatic individuals and to provide consultative services to local flight surgeons as well as the Surgeon General. The following sections discuss the major classes of electrocardiographic findings, their significance, and additional evaluations required by the USAF. Author (revised)

N94-23319# Defence and Civil Inst. of Environmental Medicine, Toronto (Ontario). Medical Assessment Section.

ECHOCARDIOGRAPHIC SCREENING OF AIRCREW CANDIDATES

GARY GRAY *in* AGARD, Cardiopulmonary Aspects in Aerospace Medicine 2 p Oct. 1993
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Military pilot training is expensive for all NATO countries, and screening techniques which detect medical conditions at selection which might later result in grounding or operational restriction of trained pilots are generally cost-effective. Although a careful physical examination and electrocardiogram will detect most disqualifying conditions, there are a number of structural cardiac abnormalities which may be missed by these standard screening measures. These include the following: mitral valve prolapse; bicuspid aortic valve; hypertrophic cardiomyopathy; left ventricular hypertrophy; diastolic dysfunction; regurgitant valves--aortic, mitral, tricuspid, and pulmonic; significant stenosis--aortic, pulmonic, and mitral; and congenital lesions, e.g. Ebstein's anomaly. Only four of thirteen NATO aeromedical agencies polled by questionnaire reported that an echo cardiogram is included in the routine initial screening of air crew candidates. The detection of disqualifying or limiting cardiac abnormalities in trained air crew is a clear argument in favor of screening, but it is really the incidence of such abnormalities detected in air crew candidates which determines the cost effectiveness of the procedure. Author (revised)

N94-23320# Air Force Systems Command, Brooks AFB, TX. Clinical Sciences Div.

ECHOCARDIOGRAPHIC FINDINGS IN TRAINED AIRCREW: THE EFFECT OF +GZ ON CARDIAC STRUCTURE (WORKING GROUP 18)

P. V. CELIO *in* AGARD, Cardiopulmonary Aspects in Aerospace Medicine 2 p Oct. 1993
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During the AGARD conference 'Medical Selection and Physiology: Training of Future Fighter Aircrew' in Apr. 1985, a paper was presented on echocardiography in Mirage 2000 pilots. In this study, 32 Mirage 2000 pilots and 34 transport pilots underwent echocardiography in order to evaluate the possibility of cardiac changes occurring because of high performance flying. The authors found a statistically significant increase in left atrial size and left ventricular septal thickness. They also felt that there was a very significant difference in right ventricular dimensions. The mean right ventricular size for the transport pilots and the Mirage pilots was 13.265 mm and 16.750 mm, respectively. They felt that 8 of the Mirage 2000 pilots had dilated right ventricles whereas only one of the transport pilots had an enlarged right ventricle. Although the cause of this apparent difference could not be determined by the study, the presence of right ventricular dilatation in high performance pilots raised a significant occupational concern among the NATO countries. Although this may simply be an artifact of the small sample size or a result of the inherent difficulty in obtaining right ventricular dimensions, the possibility that this represented a true occupational hazard was seriously considered. In order to determine the significance of this finding, a larger study was undertaken. The intention of this study is to perform a large cross-sectional study comparing the

echocardiographic findings obtained on pilots flying high sustained G aircraft with non high sustained G pilots (tanker, bomber, transport, helicopter pilots, etc.). Author (revised)

N94-23321# Royal Air Force, London (England). Central Medical Establishment.

LEFT VENTRICULAR HYPERTROPHY AND ATHLETE'S HEART

DAVID H. HULL *in* AGARD, Cardiopulmonary Aspects in Aerospace Medicine 4 p Oct. 1993
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Left ventricular hypertrophy (LVH) means literally, overgrowth of the left side of the heart. However the term is generally limited to an abnormal increase in the mass of the left ventricular heart muscle. In pathological terms, this means an increase in the size of the cardiac myocytes as opposed to hyperplasia, an increase in their number. In common parlance, any thickening of the left ventricular wall tends to be described as LVH; this is incorrect where the thickening is due to increase in the size or number of cells other than myocytes, such as fibroblasts, or to abnormal deposits, e.g. amyloid. LVH may be present with normal wall thickness in an enlarged ventricle, for example in volume overload. In health, left ventricular mass is directly related to stature and to body weight, and it increases steadily with age so a single standard (maximum) left ventricular wall thickness for all ages, both sexes, and all bodily configurations must be inappropriate. However, normative standards incorporating these sources of variability are rarely employed. Author (revised)

N94-23322# Royal Air Force, London (England). Central Medical Establishment.

AORTIC VALVE DISEASE

DAVID H. HULL *in* AGARD, Cardiopulmonary Aspects in Aerospace Medicine 2 p Oct. 1993
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The aortic valve, like the pulmonary valve, forms early in foetal cardiac development soon after the fusion of the 2 bulbar ridges which thus become a septum dividing the primitive bulbus cordis into the aortic and pulmonary trunks. Two cusps of each valve arise from the fused ridges, whilst a third cusp is formed from accessory ridges in each outflow tract. The normal arrangement is of symmetrical semilunar 3-cusped valves in the aorta and the pulmonary trunk, but variations are common. A bicuspid aortic valve is present in 1-2 percent of adults; a unicuspid or quadricuspid valve is much rarer. Bicuspid valves are 4 times commoner in men than in women. Lesser degrees of asymmetry are so common as to be the rule; in one series, only 16 percent of normal aortic valves were perfectly symmetrical in the sense that all 3 cusps were within 5 percent of each others dimensions; in 33 percent of valves, all 3 cusps differed from each other by more than this amount. The significance of these minor degrees of asymmetry, particularly with regard to the later development of aortic valve disease, is unknown. Congenital aortic valve abnormalities are common associations of other types of congenital heart disease, notably of coarctation of the aorta and ventricular septal defect. Aortic valve lesions are asymptomatic in most young people; because of this, and of male preponderance, congenital aortic valve disease is quite common in applicants for flying training; as abnormal physical signs are often trivial or absent, acceptance into air crew training is probably the rule, and the abnormality is recognized only later. Author (revised)

N94-23323# Air Force Systems Command, Brooks AFB, TX. Clinical Sciences Div.

AEROMEDICAL IMPLICATIONS OF MITRAL VALVE PROLAPSE

P. V. CELIO *in* AGARD, Cardiopulmonary Aspects in Aerospace Medicine 3 p Oct. 1993
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Mitral valve prolapse (MVP) is the most common cardiac valve disorder in the general adult population. Although the prevalence has been estimated at between 4 percent and 21 percent, the true prevalence is dependent upon the specific population

evaluated and the diagnostic criteria applied. For the adult male population of aircrew age, the prevalence is probably between 4 to 7 percent. Although the prognosis of individuals with MVP is generally good, rare complications do occur which include sudden death, infective endocarditis, stroke, transient ischemic attacks, and progressive mitral regurgitation. The following discussion will review the diagnostic criteria as well as the probable risk of each reported complication. Author (revised)

N94-23324# Royal Air Force, London (England). Central Medical Establishment.

CHRONIC OBSTRUCTIVE PULMONARY DISEASE

DAVID H. HULL /in AGARD, Cardiopulmonary Aspects in Aerospace Medicine 4 p Oct. 1993

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Chronic Obstructive Pulmonary Disease (COPD) remains a common cause of illness and death in many Western countries and is an increasing problem in developing nations. Although COPD is declining slowly in the UK, it still causes 15,000 deaths annually and is responsible for 10 percent of all working days lost through illness. This is despite improved working conditions, reduced atmospheric pollution, and decreased tobacco consumption. In the USA, COPD is the fifth most common cause of death, causing 57,000 deaths per year. It is estimated that 81.5 percent of this toll is due to cigarette smoking. Clinically apparent disease is largely confined to middle-aged and elderly people, but many young cigarette smokers can be shown to have early evidence of airways disease if adequately investigated. Two main types of COPD are seen, chronic bronchitis and emphysema, though patients may show features of both disorders. Chronic bronchitis is defined as the production of mucoid sputum on most days for at least 3 months during 2 consecutive years. Recurrent respiratory infection is increasingly common as the disease progresses. Stopping smoking may, especially early in the disease, arrest or slow its progression. Otherwise deterioration is relentless. Apart from variable rhonchi, physical signs are often slight till the onset of cor pulmonale, that is failure secondary to the broncho-pulmonary disease. Finger-clubbing, raised venous pressure, fluid retention, evidence of right ventricular hypertrophy, hypercarbia with respiratory acidosis and raised intracranial pressure, and eventually hypoxaemia are the main features; despite remissions cor pulmonale is usually fatal within a few years. Author (revised)

N94-23325# Royal Air Force, London (England). Central Medicine Establishment.

SARCOIDOSIS AND THE AVIATOR

DAVID H. HULL /in AGARD, Cardiopulmonary Aspects in Aerospace Medicine 3 p Oct. 1993

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Sarcoidosis is a chronic granulomatous disease of unknown aetiology. It is of particular importance in clinical aviation practice, for a number of reasons. Although it is a world-wide disease, it appears to be much more prevalent in the populations of developed countries. It is common in young adults; in Europe, more men than women being affected, but possibly the reverse in the USA. The onset may be acute and incapacitating, for example with florid erythema nodosum and acute arthropathy. Other cases are a symptomatic and may be detected only by special tests, e.g., screening chest x-ray, ECG, or blood biochemistry. Though often apparently confined to the thorax, sarcoidosis is typically a multi-system disease with involvement, often silent, of many organs: the skin, eyes, liver, spleen, lymphnodes, bone, central nervous, and cardiovascular systems. Hypercalcaemia is quite a common feature but causes symptoms only when potentially dangerous blood calcium levels are attained. No curative treatment is known, but moderate, severe or progressive disease usually leads to steroid treatment which may have to be prolonged and given in high doses. Cardiac involvement is often inapparent, but can be present with incapacitating arrhythmias, complete heart block with Stokes-Adams attacks, or sudden death. A table summarizes the aspects of main aeromedical concern. Author (revised)

N94-23326# Royal Air Force, London (England). Central Medical Establishment.

SPONTANEOUS PNEUMOTHORAX, CYSTS AND BULLAE

DAVID H. HULL /in AGARD, Cardiopulmonary Aspects in Aerospace Medicine 2 p Oct. 1993

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Spontaneous pneumothorax is defined as the presence of air in the pleural cavity without apparent cause. Pulmonary conditions such as tuberculosis or cancer may cause spontaneous pneumothorax, but are excessively rare in aeromedical practice. The usual victims are apparently healthy young men, often in the third decade of life, very often tall and of lean, asthenic build. The chest x-ray may be normal before or after the illness, but may show sub-pleural blebs or small cysts, usually at the lung apex; the rupture of a bleb creates a broncho-pleural communication and the natural elastic lung recoil plus negative pleural pressure draws air into the pleural space. Consequent pulmonary collapse and contraction will narrow and perhaps seal the defect, which usually closes spontaneously in a few days. However the air may take several weeks to reabsorb fully, especially if the pneumothorax is large, so that some form of evacuation of the air, e.g., by underwater seal or flutter valve, is usually desirable for any but the smallest pneumothoraces. The disease is disproportionately important in aeromedical practice, for various reasons. Author (revised)

N94-23327# Defence and Civil Inst. of Environmental Medicine, Toronto (Ontario). Medical Assessment Section.

ASTHMA IN AIRCREW

GARY GRAY /in AGARD, Cardiopulmonary Aspects in Aerospace Medicine 3 p Oct. 1993

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Asthma is a disease characterized by airway inflammation and increased bronchial reactivity. Symptoms, which characteristically are variable, include wheezing, shortness of breath, chest tightness, and cough with sputum. In the past, attention was focused on the airway hyper-reactivity with bronchospasm and wheezing, and treatment was directed towards bronchodilation as first line therapy. In recent years the central role of airway inflammation in the pathogenesis of asthma has gained increasing recognition. Airway inflammation is present in even mild asthmatics, and the treatment of asthma has evolved towards more aggressive management of the underlying inflammatory response as a key element in control. Author (revised)

N94-23328# Royal Air Force, London (England). Central Medical Establishment.

ARTERIAL HYPERTENSION AND THE AVIATOR

DAVID H. HULL /in AGARD, Cardiopulmonary Aspects in Aerospace Medicine 7 p Oct. 1993

Copyright Avail: CASI HC A02/MF A01

Arterial hypertension is of great importance in the practice of clinical aviation medicine, mainly because of its prominence as a major risk factor for coronary artery disease and other disabling cardiovascular diseases and because it is so common. Timely recognition of early or mild hypertension should facilitate appropriate intervention which will prevent complications and enable the air crewman to continue his career, hopefully, to normal retirement age. The consequent health benefits and fiscal advantages, both to the individual and to the air forces and airlines of the world, are obvious and substantial. Author (revised)

N94-23331# Louisville Univ., KY. Dept. of Microbiology and Immunology.

CYTOKINES AND IMMUNE SURVEILLANCE IN HUMANS Final Report

GERALD SONNENFELD 7 Jan. 1994 5 p

(Contract NAG9-485)

(NASA-CR-194801; NAS 1.26:194801) Avail: CASI HC A01/MF A01

Evidence from both human and rodent studies has indicated that alterations in immunological parameters occur after space flight. Among the parameters shown, by us and others, to be

affected is the production of interferons. Interferons are a family of cytokines that are antiviral and play a major role in regulating immune responses that control resistance to infection. Alterations in interferon and other cytokine production and activity could result in changes in immunity and a possible compromise of host defenses against both opportunistic and external infections. The purpose of the present study is to explore further the effects of space flight on cytokines and cytokine-directed immunological function. Among the tests carried out are interferon-alpha production, interferon-gamma production, interleukin-1 and -2 production, signal transduction in neutrophils, signal transduction in monocytes, and monocyte phagocytic activity. The experiments will be performed using peripheral blood obtained from human subjects. It is our intent to eventually carry out these experiments using astronauts as subjects to determine the effects of space flight on cytokine production and activity. However, these subjects are not currently available. Until they become available, we will carry out these experiments using subjects maintained in the bed-rest model for microgravity.

Derived from text

N94-23530* National Aeronautics and Space Administration, John F. Kennedy Space Center, Cocoa Beach, FL.

RESPONSES TO LBNP IN MEN WITH VARYING PROFILES OF STRENGTH AND AEROBIC CAPACITY: IMPLICATIONS FOR FLIGHT CREWS Technical Paper, Jul. 1985 - Apr. 1986

VICTOR A. CONVERTINO, KAREN L. MATHES (Krug International, Houston, TX.), MARY L. LASLEY (Bionetics Corp., Cocoa Beach, FL.), CLARE MARIE TOMASELLI (John B. Pierce Foundation of Connecticut, New Haven, CT.), MARY ANNE BASSETT FREY (Lockheed Engineering and Sciences Co., Washington, DC.), and G. WYCKLIFFE HOFFLER Mar. 1993 36 p (NASA-TP-3346; NAS 1.60:3346) Avail: CASI HC A03/MF A01

Hemodynamic and hormonal responses to lower-body negative pressure (LBNP) were examined in 24 healthy men to test the hypothesis that responsiveness of reflex control of blood pressure during orthostatic stress is associated with strength and/or aerobic capacity. Subjects underwent treadmill tests to determine peak oxygen uptake (peak VO₂) and isokinetic dynamometer tests to determine leg strength. Based on predetermined criteria, the subjects were classified into one of four fitness profiles of six subjects each matched for age, height, and weight: (1) low strength/low aerobic fitness; (2) low strength/high aerobic fitness; (3) high strength/low aerobic fitness; and (4) high strength/high aerobic fitness. Following 90 min of 6 degree head-down tilt (HDT), each subject underwent graded LBNP through -50 mmHg or presyncope, with maximal duration 15 min. All groups exhibited typical hemodynamic, hormonal, and fluid shift responses during LBNP, with no intergroup differences except for catecholamines. Seven subjects, distributed among the four fitness profiles, became presyncopal. Subjects who showed greatest reduction in mean arterial pressure (MAP) during LBNP had greater elevations in vasopressin and lesser increases in heart rate and peripheral resistance. Peak VO₂ nor leg strength were correlated with fall in MAP or with syncopal episodes. We conclude that neither aerobic nor strength fitness characteristics are good predictors of responses to LBNP stress.

Author

N94-23544* National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, TX.

FLUID-LOADING SOLUTIONS AND PLASMA VOLUME: ASTRO-ADE AND SALT TABLETS WITH WATER

SUZANNE M. FORTNEY, LAURA SEINMANN (Krug Life Sciences, Inc., Houston, TX.), JOAN A. YOUNG (Krug Life Sciences, Inc., Houston, TX.), CHERYLANN N. HOSKIN (Krug Life Sciences, Inc., Houston, TX.), and LINDA H. BARROWS (Krug Life Sciences, Inc., Houston, TX.) Jan. 1994 24 p (NASA-TP-3456; S-756; NAS 1.60:3456) Avail: CASI HC A03/MF A01

Fluid loading with salt and water is a countermeasure used after space flight to restore body fluids. However, gastrointestinal side effects have been frequently reported in persons taking similar quantities of salt and water in ground-based studies. The effectiveness of the Shuttle fluid-loading countermeasure (8 gms

salt, 0.97 liters of water) was compared to Astro-ade (an isotonic electrolyte solution), to maintain plasma volume (PV) during 4.5 hrs of resting fluid restriction. Three groups of healthy men (n=6) were studied: a Control Group (no drinking), an Astro-ade Group, and a Salt Tablet Group. Changes in PV after drinking were calculated from hematocrit and hemoglobin values. Both the Salt Tablet and Astro-ade Groups maintained PV at 2-3 hours after ingestion compared to the Control Group, which had a 6 percent decline. Side effects (thirst, stomach cramping, and diarrhea) were noted in at least one subject in both the Astro-ade and Salt Tablet Groups. Nausea and vomiting were reported in one subject in the Salt Tablet Group. It was concluded that Astro-ade may be offered as an alternate fluid-loading countermeasure but further work is needed to develop a solution that is more palatable and has fewer side effects.

Author (revised)

N94-23575* National Aeronautics and Space Administration, Ames Research Center, Moffett Field, CA.

EXERCISE, EXERCISE TRAINING, AND THE IMMUNE SYSTEM. A COMPENDIUM OF RESEARCH (1902-1991)

A. J. HARDESTY, J. E. GREENLEAF, S. SIMONSON (University of Northern Colorado, Greeley, CO.), A. HU (University of Northern Colorado, Greeley, CO.), and C. G. R. JACKSON (University of Northern Colorado, Greeley, CO.) Nov. 1993 167 p (Contract RTOP 199-18-12-07) (NASA-TM-108778; A-93091; NAS 1.15:108778) Avail: CASI HC A08/MF A02

This compendium includes abstracts and synopses of clinical observations and of more basic studies involving physiological mechanisms concerning interaction of physical exercise and the human immune system. If the author's abstract or summary was appropriate, it was included. In other cases, a more detailed synopsis of the paper was prepared under the subheadings 'Purpose,' 'Methods,' 'Results,' and 'Conclusions.' Author and subject indices are provided, plus a selected bibliography of related work or those papers received after the volume was being prepared for publication. This volume includes material published from 1902 through 1991.

Author (revised)

N94-23623* Civil Aeromedical Inst., Oklahoma City, OK.

VISION IMPAIRMENT AND CORRECTIVE CONSIDERATIONS OF CIVIL AIRMEN

VAN B. NAKAGAWARA, KATHRYN J. WOOD, and RONALD W. MONTGOMERY Dec. 1993 8 p (DOT/FAA/AM-93/21) Avail: CASI HC A02/MF A01

Civil aviation is a major commercial and technological industry in the United States. The Federal Aviation Administration (FAA) is responsible for the regulation and promotion of aviation safety in the National Airspace System. The Office of Aviation Medicine oversees investigations on visual disorders and vision corrective devices of airmen and air traffic controllers. A review of the demographics of the civil airman population was performed using FAA publications and databases. Approximately 48 percent of the civil airman population is greater than or equal to 40 years of age (average age = 39.8 years). Many of these aviators are becoming presbyopic and will need corrective devices for near and intermediate vision. In fact, there has been an approximate 12 percent increase in the number of aviators with near vision restrictions in the last decade. Ophthalmic considerations for eye care practitioners prescribing and dispensing for civil aviators are discussed. This data is useful for the Office of Aviation Medicine to guide policy changes and educational programs for airmen with vision impairment and who use corrective ophthalmic lenses in the aviation environment, particularly the increasing number of presbyopic airmen.

Author (revised)

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BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N94-21810* Houston Univ., TX. Dept. of Psychology.
**THE EFFECTS OF INSTRUCTIONAL SETS ON REACTIONS TO
 AND PERFORMANCE ON AN INTELLIGENT TUTORING
 SYSTEM Final Technical Report**

DEBRA STEELE JOHNSON 20 Dec. 1993 50 p
 (Contract NAG9-555)
 (NASA-CR-194739; NAS 1.26:194739) Avail: CASI HC A03/MF
 A01

The effects of a contextual factor, i.e., task instructions, on performance on and reactions to an Intelligent Tutoring System (ITS) training Remote Manipulator System (RMS) tasks were examined. The results supported the first prediction that task instructions could be used to successfully induce a mastery versus an achievement orientation. Previous research suggests that a mastery orientation can result in beneficial effects on learning and performance of complex tasks. Furthermore, the results supported the second prediction that a mastery orientation would have beneficial effects on learning and performance as well as affective and cognitive reactions to the ITS tasks. Moreover, the results indicated that a mastery orientation was especially beneficial for the more complex ITS tasks and later in task practice, i.e., when a task was performed for the second time. A mastery orientation is posited to have its beneficial effects by focusing more effort and attention on task performance. Conclusions are drawn with some caution due to the small number of subjects, although the results for these subjects were consistent across multiple trials and multiple measures of performance. ITS designers are urged to consider contextual factors such as task instructions and feedback in terms of their potential to induce a mastery versus an achievement orientation. Author (revised)

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MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N94-21812* National Aeronautics and Space Administration.
 Lyndon B. Johnson Space Center, Houston, TX.
EVA TOOLS AND EQUIPMENT REFERENCE BOOK
 R. K. FULLERTON Nov. 1993 737 p Revised
 (NASA-TM-109350; NAS 1.15:109350; JSC-20466-REV-B) Avail:
 CASI HC A99/MF A06

This document contains a mixture of tools and equipment used throughout the space shuttle-based extravehicular activity (EVA) program. Promising items which have reached the prototype stage of development are also included, but should not be considered certified ready for flight. Each item is described with a photo, a written discussion, technical specifications, dimensional drawings, and points of contact for additional information. Numbers on the upper left-hand corner of each photo may be used to order specific pictures from NASA and contractor photo libraries. Points of contact were classified as either operational or technical. An operational contact is an engineer from JSC Mission Operations Directorate who is familiar with the basic function and on-orbit use of the tool. A technical contact would be the best source of detailed technical specifications and is typically the NASA subsystem manager. The technical information table for each item uses the following terms to describe the availability or status of

each hardware item: Standard - Flown on every mission as standard manifest; Flight specific - Potentially available for flight, not flown every mission (flight certification cannot be guaranteed and recertification may be required); Reference only - Item no longer in active inventory or not recommended for future use, some items may be too application-specific for general use; and Developmental - In the prototype stage only and not yet available for flight. The current availability and certification of any flight-specific tool should be verified with the technical point of contact. Those tools built and fit checked for Hubble Space Telescope maintenance are program dedicated and are not available to other customers. Other customers may have identical tools built from the existing, already certified designs as an optional service. Author (revised)

N94-22997* Oak Ridge National Lab., TN.
**EYE-GAZE CONTROL OF THE COMPUTER INTERFACE:
 DISCRIMINATION OF ZOOM INTENT**

J. H. GOLDBERG (Pennsylvania State Univ., University Park.) and J. C. SCHRYVER 1993 6 p Presented at the Human Factors and Ergonomics Society Meeting, Seattle, WA, 11-15 Oct. 1993
 (Contract DE-AC05-84OR-21400; DE-AC05-76OR-00033)
 (DE94-000480; CONF-9310100-3) Avail: CASI HC A02/MF A01

An analysis methodology and associated experiment were developed to assess whether definable and repeatable signatures of eye-gaze characteristics are evident, preceding a decision to zoom-in, zoom-out, or not to zoom at a computer interface. This user intent discrimination procedure can have broad application in disability aids and telerobotic control. Eye-gaze was collected from ten subjects in a controlled experiment, requiring zoom decisions. The eye-gaze data were clustered, then fed into a multiple discriminant analysis (MDA) for optimal definition of heuristics separating the zoom-in, zoom-out, and no-zoom conditions. Confusion matrix analyses showed that a number of variable combinations classified at a statistically significant level, but practical significance was more difficult to establish. Composite contour plots demonstrated the regions in parameter space consistently assigned by the MDA to unique zoom conditions. Peak classification occurred at about 1200-1600 msec. Improvements in the methodology to achieve practical real-time zoom control are considered. DOE

N94-23080* Fairchild Space Co., Germantown, MD.
**MANNED MARS MISSION ON-ORBIT OPERATIONS FTS
 CAPABILITIES ASSESSMENT Final Report**
 FRANK G. GALLO and STEWART W. JACKSON 30 Jun. 1989
 54 p
 (Contract NAS5-30189)
 (NASA-CR-189328; NAS 1.26:189318) Avail: CASI HC A04/MF
 A01

This document presents an overview of the characteristics and capabilities of the flight telerobotic servicer (FTS), under development at GSFC at the time the report was prepared; the project has since been cancelled. The assessment was directed toward developing the FTS to enable assembly and servicing of the Mars vehicle at the space station; facilitate rendezvous, docking, and fluid transfer operations involving the Mars vehicle fuel tank; to perform strip-mining operations on the lunar/martian surfaces; and to construct a three-story shelter on the martian surface. The report considers the FTS' mechanical, electrical, thermal, and operational subsystems, as well as its proposed manipulator capabilities. Author (revised)

N94-23083* Galaxy Scientific Corp., Pleasantville, NJ.
PILOT-VEHICLE INTERFACE Final Report
 L. HARRISON, J. JANOWITZ, and M. CASTRONUOVO Nov.
 1993 182 p
 (Contract DTFA03-89-C-00043)
 (DOT/FAA/CT-92/21) Avail: CASI HC A09/MF A02

The cockpits of the early transport aircraft were quite different from those produced today. Older cockpits contained numerous 'steam gauge' style indicators. As technology advanced, these older electromechanical indicators were gradually replaced by newer, more reliable digital systems. Digital flight control and avionic

systems are being used increasingly in modern aircraft. This trend yields cockpits of greater complexity and has swelled the amount of information with which the crew must deal. The way the pilot controls and monitors the state of the aircraft has also been greatly influenced by the increased use of digital systems. Additionally, new methods of aircraft system monitoring and control are being researched and implemented. These systems use new display technology, programmable display formats, voice input and output, and other new input and control devices. Systems and their cockpit interfaces were added as technological advances were made and new requirements generated. The human interface was given little consideration in the layout of the cockpit. Human qualities and failure modes were not taken into account in the cockpit design process. As the number of systems, components, indicators, and switches multiplied, the potential for error also grew. The emphasis of this report is on civil transport aircraft. This includes technologies such as displays, controls, and design methodologies, along with human factors concerns. The report consists of four sections: civil transport cockpit, cockpit standards, cockpit technology, and cockpit human factors. This report is to serve as a guide to Certification Engineers who are faced with the task of certification of new cockpit technologies. Author

N94-23290* # Martin Marietta Corp., Denver, CO. Advanced Launch Systems.

TASK 1: HEALTH MANAGEMENT DEMONSTRATION. TASK 2: PROCESS MANAGEMENT ENVIRONMENT AND SUPPORT OF ENTERPRISE INTEGRATION. TASK 3: NEW ALGORITHM DEVELOPMENT IN THE PME Final Report

W. A. CLARK and D. WILKS 30 Sep. 1993 138 p
(Contract NAS9-18879)
(NASA-CR-188268; NAS 1.26:188268; MCR-93-5013) Avail:
CASI HC A07/MF A02

Integrated Vehicle Health Management (IVHM) consists of instrumenting measurable parameters to collect information on an existing system that then aids decision making which leads to reduced life-cycle costs. The information must be extracted from data measured and reduced to a point where people can make good, logical decisions. IVHM requires sensors coupled to data reduction systems that allow patterns to be detected, operating environments characterized, and system performance verified in order to optimize the overall system to reduce costs. A key component in building an IVHM system is the communications capability between the actual parameter being measured and the final user of the information extracted. This information flow must be sufficiently flexible to allow the sensors and parameters measured to change as the needs and requirements of the overall system changes. The first step in creating an IVHM is to make the sensor interface more intelligent and thereby more flexible. This is a Final Report for the NASA Research Announcement (NRA) Strategic Avionics Technology Definition Studies Martin Marietta Task entitled 'Health Management and Process Demonstration for Aerospace Systems'. This report covers Task 1: Health Management Demonstration and is submitted to Johnson Space Center (JSC) in fulfillment of the reports of work specified in the contract (NAS9-18879). Task 2: Process Management Environment and Support of Enterprise Integration, and Task 3: New Algorithm Development in the PME, are also presented.

Derived from text

N94-23527* # Western Aerospace Labs., Inc., Monte Sereno, CA.

ACTIVITY CATALOG TOOL (ACT) USER MANUAL, VERSION 2.0

LEON D. SEGAL and ANTHONY D. ANDRE Jan. 1994 25 p
(Contract NCC2-486)
(NASA-CR-177634; A-94046; NAS 1.26:177634) Avail: CASI HC A03/MF A01

This report comprises the user manual for version 2.0 of the Activity Catalog Tool (ACT) software program, developed by Leon D. Segal and Anthony D. Andre in cooperation with NASA Ames Aerospace Human Factors Research Division, FLR branch. ACT is a software tool for recording and analyzing sequences of activity

over time that runs on the Macintosh platform. It was designed as an aid for professionals who are interested in observing and understanding human behavior in field settings, or from video or audio recordings of the same. Specifically, the program is aimed at two primary areas of interest: human-machine interactions and interactions between humans. The program provides a means by which an observer can record an observed sequence of events, logging such parameters as frequency and duration of particular events. The program goes further by providing the user with a quantified description of the observed sequence, through application of a basic set of statistical routines, and enables merging and appending of several files and more extensive analysis of the resultant data. Author (revised)

N94-23743 National Defence Research Establishment, Linköping (Sweden). Huvudadelning för Maenskaplig Prestation och Funktion.

SURVIVAL SUIT FOR SUBMARINE PERSONNEL: SUMMARY OF EVALUATION STUDIES (RAEDDNINGSDRAEKT FOER UBATSPERSONAL: SLUTRAPPORT)

MIKAEL GENNSEN, AKE LARSSON, and HANS OERNHAGEN Mar. 1993 33 p In SWEDISH See also PB90-201021 Limited Reproducibility: More than 20% of this document may be affected by microfiche quality (ISSN 0281-0239)
(PB93-204634; FOA-A-50014-5.1) Avail: CASI HC A03

Survival suits for submarine personnel should be able to protect against drowning and hypothermia for long periods of severe weather conditions. The Division of Naval Medicine of the Swedish Defense Research Establishment has carried out a series of tests of survival suits with and without a one-man life-raft in cold water during simulated winter conditions. Tests were also carried out with a modified suit to evaluate suggested modifications. The tests were completed with a study of the buoyancy and floating position of the suits in heavy sea. An investigation of different materials for diapers to improve the urine collection system and an experimental study regarding the possibility of reducing the urine output during stays in cold water using a synthetic antidiuretic hormone were also carried out. In the report the main results of the tests are summarized, the problems with the various suits are discussed, and improvements are suggested. In conclusion three suit concepts that are thought to be able to fulfill the requirements are described and ranked: (1) a double-layered suit with life-raft, (2) a single-layered suit with extra buoyancy and life-raft, and (3) a modified double-layered suit with extra buoyancy. NTIS

N94-23744 Eurocontrol Experimental Centre, Bretigny (France). **HARMONISATION OF MAN-MACHINE INTERFACE EXPERIMENTS IN THE CONTEXT OF THE DEVELOPMENT OF PHARE ADVANCED TOOLS Report, Jan. - Aug. 1992**

S. BROADBENT 1993 130 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality (PB93-204725; EEC-256) Copyright Avail: Issuing Activity (National Technical Information Service (NTIS))

The objective of the document is to provide PHARE researchers concerned with Human-Machine Interfaces (HMI) evaluation studies with a series of indications as to the experimental methods that can be employed to evaluate interface prototypes. The document does not require the reader to have specific expertise in human factors experimental methods, but attempts to provide the background for some fundamental principles of experimental design. The proposed evaluation methodology consists of a controlled experimental methodology which will involve part-task investigations, i.e., a small sub-component of the control activity will be examined in each study. The experimenter isolates the function or functions of the interface that require close scrutiny and design specific experimental environments to assess users' interactions with that particular feature of the interface. Ten steps of experimentation are detailed in the document including the selection of assessment measures, the selection of experimental subjects, and decisions about design and results analysis. For each step a number of indications is provided on the rationale behind one or another design option. NTIS

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SPACE BIOLOGY

Includes exobiology; planetary biology; and extraterrestrial life.

N94-23754 Finnish Artificial Intelligence Society, Helsinki.
**SETI: SEARCH FOR EXTRATERRESTRIAL INTELLIGENCE. AN
INTERNATIONAL INTERDISCIPLINARY SEMINAR, STAR
DAYS**

S. LINNALUOTO and J. SEPPAENEN 1992 237 p Conference
held in Heureka, Vantaa, Finland, 6-7 Mar. 1993 See also
PB93-161206 Prepared in cooperation with Helsinki Univ. of
Technology, Espoo, Finland Limited Reproducibility: More than
20% of this document may be affected by microfiche quality
(PB93-230597; ISBN-951-96735-0-4) Avail: Issuing Activity
(National Technical Information Service (NTIS))

The volume contains papers read at the International
Interdisciplinary Seminar on SETI - Search for Extraterrestrial
Intelligence held on 6-7 March 1993 at Heureka, The Finnish
Science Center, Vantaa, Finland. The aim of the seminar was to
bring together specialists on SETI from abroad as well as Finnish
scientists from nearby disciplines to present their views and to
discuss the question of life and especially of intelligent life and
technological civilizations elsewhere in our universe. NTIS

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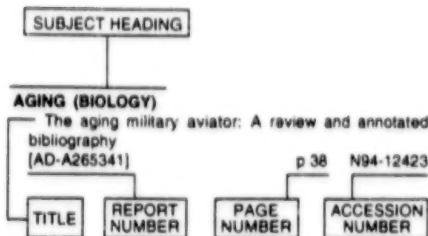
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Typical Subject Index Listing



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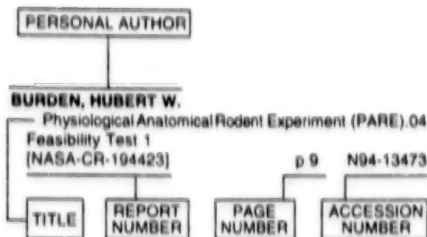
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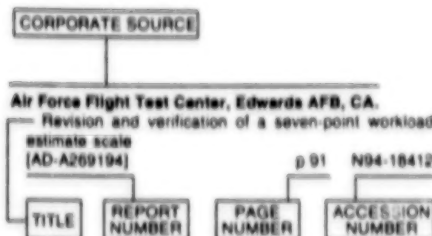
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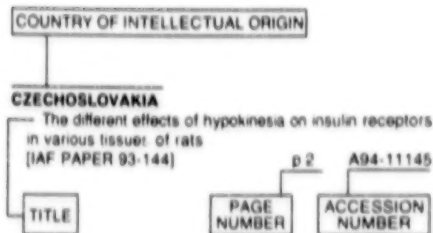
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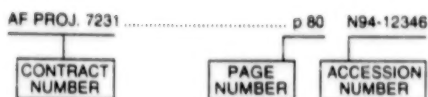
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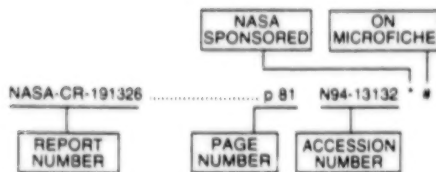
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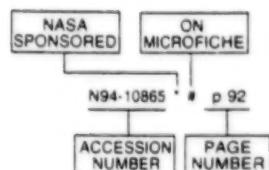
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